PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

NEW SERIES NUMBER TWENTYFOUR

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LOCATION. The institute's laboratories and offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and the institute should be advised of despatch by letter or telegram.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on any matter that may require examination of living material must first inquire by letter.

ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to Estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of the Institute's budding mandores. INTERVIEWS should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The institute is open from 8 am to 1 pm and 2 pm to 4 pm on Mondays to Fridays, and from 8 am to 12.30 pm on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

PUBLICATIONS. A list of 'Publications of the R.R.I.' is available on request. Subscription may be made by depositing $15 with us. An annual statement of account will then be submitted.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur May 1956 Number 24

Editorial: Fertiliser Nomenclature

The plant food ingredients provided by most fertiliser mixtures are nitrogen, phosphorus, and potassium, and sometimes magnesium as well, but for many years there has been controversy on the most suitable terms for expressing the fertiliser content of these elements.

Recently, the new Fertiliser and Feeding Stuffs Regulations, 1955 published by Her Majesty's Stationery Office, London, contained a note on nomenclature of fertiliser constituents which indicates that a move may be made towards settling the controversy.

The regulations, which embody the recommendations of a Standing Advisory Committee contain a note on the nomenclature of fertiliser constituents, which suggests that fertiliser manufacturers 'should declare, in addition to the chemical constituents at present prescribed, (N, P_2O_5, and K_2O), the equivalent figures for the plant food elements phosphorus (P) and potassium (K) and so pave the way for an ultimate compulsory requirement to declare statutory particulars of composition in terms of the elements'.

The present terms are a relic from the early days of agricultural chemistry when the oxides of the elements were regarded as the basic units for all chemical reactions, but their continued use involves several anomalies. For example, why should the nitrogen content of a fertiliser be expressed in terms of the element while phosphorus and potassium are expressed in terms of their oxides? There is no factor in the mechanism of their uptake by the plant which would suggest such a difference. To the chemist, the formula P_2O_5 represents phosphorus pentoxide, but in the fertiliser trade these symbols are referred to as phosphoric acid, which is a different substance but, admittedly, derived from the oxide. With potassium, there is even less excuse for the use of the chemical formula of the oxide, K_2O, because potassium, in the fertiliser muriate of potash, is completely associated with chlorine.

The need for simplifying fertiliser nomenclature has recently been under review by the Soil Science Society of America. A technical subcommittee of the Society discussed the *pros* and *cons* of the two systems and came down heavily in favour of the elemental system concluding that 'the logic is apparent of any change which simplifies, adds consistency or uniformity, increases the accuracy and greatly improves the usefulness of the system'.

The main advantages of the proposed change would be to workers in all branches of agricultural science, particularly in plant and animal nutrition, where the composition of soils, plants, nutrient solutions, fertilisers and feeding stuffs has to be expressed in terms of chemical elements or compounds. By having one uniform system of specification,

using nutrient chemical elements N, P, and K, for expressing concentrations of nitrogen, phosphorus and potassium the gain in simplicity and ease of comparison would be considerable.

There are several arguments against the change. If the phosphorus and potassium contents of a fertiliser be expressed in terms of the element, the percentage content of the nutrient would appear to be less than when expressed as the oxide (*e.g.* 18% P_2O_5 = 7.9% P, and 60% K_2O = 50% K). Crop growers might be confused at first and apply greater quantities of fertiliser than necessary. A further point is that many mixed fertilisers are at present compounded to give convenient ratios of N : P_2O_5 : K_2O, which would be changed under the proposed system, giving unfamiliar ratios. As an example, a ratio of 1 : 1 : 1 would become 7 : 3 : 6 under the new system. However, in view of the present-day close cooperation between the grower and his advisory and fertiliser services, such problems should involve no great difficulties and a smooth change over should be possible.

In the particular instance of the rubber plantation industry of Malaya, the planter need not be apprehensive of difficulties which any such change of nomenclature might cause. Many of the fertiliser mixtures are marketed under names or numbers recommended by the producers or by the Institute, and for straight fertilisers, providing one nutrient element, adequate advisory services exist to explain any differences in specification.

We would welcome a change therefore in fertiliser nomenclature on the grounds that the existing system is illogical and out moded, that the new proposals would not create difficulties for the rubber planter, and that the technical and advisory services connected with the plantation industry would appreciate the rationalisation and simplification which would result.

Correspondence

The Editor of PLANTERS' BULLETIN *invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome. The name and address of the writer must be given in full, but may be withheld from publication if desirable.*

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HARDY SEED

It may be of interest to your readers to learn that I despatched a consignment of 10,000 Tjir 1 selfed seed on the railway to Malacca. Due to an oversight the consignment was mislaid and was returned to me again in Kedah, having been delayed on the railway 14 days.

On germination of these seed a success of over 90% was obtained. The seeds were simply packed in plain double rice bags with no charcoal or sawdust.

Gadek Rubber Estates Ltd
J.G. Allen
Manager

This is further evidence of the longevity of newly collected rubber seed, although we suspect that the consignment was fortunate in being protected from direct sun during its wanderings. We would not advise readers to emulate this length of storage—Editor

Air Drying of Rubber

We have pleasure in presenting a guest article by Mr D. H. Frean of the General Electric Co. The author has been concerned with drying shed design for the past few years and here reviews some of the factors which need to be considered when an estate requires to install new drying facilities. A new type of air drying shed which has been erected on Senawang Estate is described.

A NUMBER OF RUBBER ESTATES which have replanted with high yielding stock are now finding that as the new trees come into bearing that their existing facilities for drying rubber are no longer adequate. This article has been written to review some of the points that should be considered when deciding on what form new drying facilities should take.

NATURAL DRYING

Natural drying is still used for drying crepe as there are no fuel costs to consider, and the only direct cost is for the labour required to hang the crepe in the drying shed. The drawback of this system is that drying is very slow — in some instances as long as fifteen days — and that the drying is largely at the mercy of the weather. This means that the drying sheds must be large enough to accommodate up to half a month's production. Apart from the huge sheds required and the amount of rubber that has to be held on the estate, there is always the danger of mould attacking the crepe in bad weather. With sheet, the problem is even more acute and nearly all air dried sheet is dried by artificial means.

FACTORS AFFECTING DRYING

The main reason why natural drying takes so long is that drying only takes place during the day. The amount of water generally present in the atmosphere in Malaya is such that at night, when the temperature falls, the humidity rises to near saturation point. The capacity of air for absorbing moisture depends on its humidity: the lower the humidity the more water the air can absorb. Humidity itself depends on the air dry bulb temperature, which means that the hotter the air, the more moisture it will take up before it becomes saturated. Air which is saturated at one temperature can still be made to absorb moisture if its temperature is raised. In brief, most moisture is taken up when the air temperature is maintained at the highest figure that can be used without damage to the rubber.

A further advantage of a high drying temperature is that, due to the properties of wet rubber, the water held inside the rubber is assisted to diffuse to the surface. This is fortunate, otherwise the design of drying equipment would become most complicated. The problem is not quite as simple as it may first appear, however, because too great a temperature, especially in the early stages of drying, can have an adverse effect on the quality of the rubber. Blistering and tackiness are the two main effects of overheating. Blisters are formed because tiny pockets of gas or vapour are trapped in the rubber, expand too rapidly and rupture the rubber instead of diffusing gently to the surface. Tackiness,

on the other hand, is due to actual changes in the rubber owing to excess temperature. Blistering at high temperature can be avoided by combining a high drying temperature with a higher humidity without incurring any serious increase in tackiness. This enables the rate of diffusion to be achieved without deleterious surface effects.

From the foregoing it is clear that for complete control of the drying process it is necessary to have a good measure of control over not only the drying temperature, but also over the drying humidity. This is advisable from the standpoint of economics as well. If warm air is allowed to escape from the drier before it has absorbed the optimum quantity of water — the optimum is before it has reached the humidity at which drying virtually ceases — a considerable amount of heat will be wasted.

DRYING WITH HEAT

The most successful type of sheet rubber drying installation in general use today is the standard R.R.I. tunnel type smokehouse. Although the drying medium in this instance is not air alone but a mixture of air and the products of combustion from the furnace, the principles employed in its design are those just mentioned except that control of humidity has to be subordinated to the need for maintaining the required temperature gradient. Other types of drying installations, however, do not, with one or two notable exceptions, make the best use of the heat available.

Turning to crepe drying, as the second most important, a considerable saving of drying time has been achieved by installing heating equipment in natural drying sheds and converting to hot air drying. A common method of conversion is to lay numbers of steam or hot water pipes along the floors, which allows the hot air to rise up through the shed by convection. The drawback with this method is that a large number of pipes are required and even then control over the air is difficult and distribution of the heat remains uneven. To make the most of this system all the unnecessary openings in the building must be sealed so that a positive control of the air-change rate can be achieved. Air inlets should be as low as possible, and the outlets at roof level. The distribution of the heated air within the building depends on the initial design and cannot readily be altered. Where proper distribution cannot be obtained, mechanical control by using fans can produce the desired result. Developing this idea one stage further, it is possible to do away with the floor pipe system altogether and to use proper air heaters.

AIR HEATING EQUIPMENT

The two most important types of air heaters are the steam or hot water type of air heater battery, and the oil-fired hot air furnace.

The air heater battery is similar in appearance to a motor car radiator, it consists of a number of finned tubes through which the heating medium circulates. Air is blown through the heater by means of a fan and the hot air is then circulated through the drier.

Where a steam or hot water supply is not already available a simpler method of heating the air is to use a direct-fired hot air furnace. This

heater consists of an oil burner and a heat exchanger. In the heat exchanger the hot flue gases transfer most of their heat to the air which is blown through the unit by a fan. In this way none of the products of combustion ever come in direct contact with the rubber.

WASTAGE OF HEAT

Apart from the heat that can be wasted by not allowing the air to carry away the greatest amount of moisture possible, a considerable amount of heat is lost from a drier by conduction through the walls. Especially in the later stages of drying, this loss can be greater than the heat actually needed to complete the drying. Insulation can be achieved in a number of ways. Generally, the best results are obtained by lining the walls with a suitable material and having an air space which acts as a blanket. A sealed air space is one of the best insulating media possible.

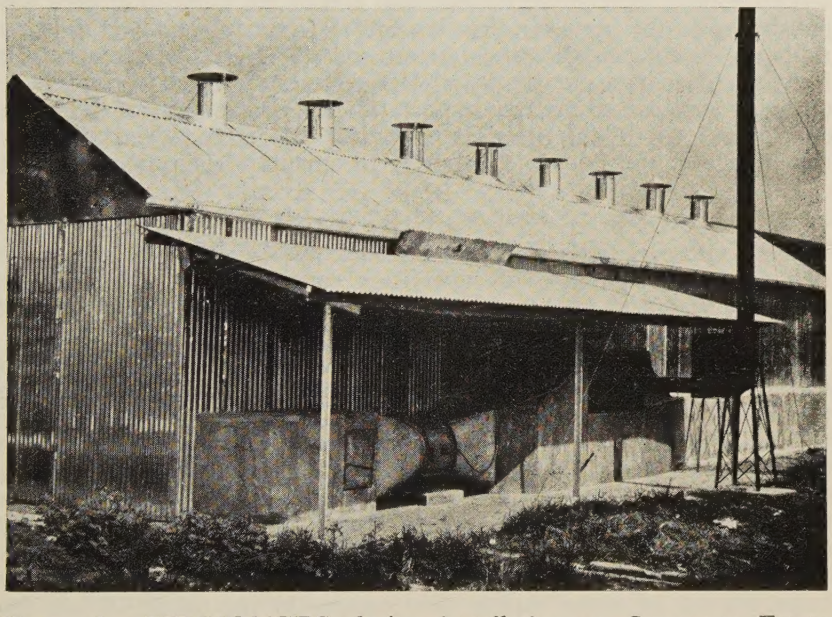

Figure 1. ESTCOM/GEC drying installation on Senawang Estate. The air recirculation duct fan and heater can be seen in the foreground.

A NEW TYPE OF AIR DRIER

Combining all the principles mentioned above, it was obvious that the most efficient type of drier would be one in which accurate control of temperature and humidity could be easily achieved. For ease of handling and the saving of fuel it was decided that a tunnel built on the lines of the R.R.I. type B smokehouse but with air recirculation would be the most suitable.

A number of preliminary trials were made by Mr E.A. Eno, then Manager of Senawang Estate, where a prototype tunnel was built. This

tunnel was built as a multi-purpose tunnel so that it could be used for the production of either smoked sheet, air dried sheet, or crepe.

Basically the tunnel is a standard R.R.I. type B smokehouse fitted with a fan, an oil-fired air heater, and a duct for recirculating the air.

The general appearance of the air drying installation can be seen in the photograph, *Figure 1*. The duct connects the two ends of the tunnel and the air circulating fan and the hot air furnace are in the centre of the duct. Fresh air is drawn in through the inlet by the fan, is then heated, and then travels through the tunnel before returning once more to the heater. In operation, fresh air is being drawn in continually through the inlet and wet air is discharged continually through the roof ventilators. By regulating the position of the inlet and outlets, the humidity can be maintained at the desired value to permit drying without wastage of heat. The drying temperature is controlled by means of a thermostat and can be set and maintained at any level without supervision.

The trolleys enter at the downstream end of the tunnel and each day are moved in the opposite direction to the airstream so that the driest rubber is in contact with the warmest and driest air. Air movement is fairly rapid so that the air in contact with every sheet is continually changing and also so that the temperature difference between the upper and lower levels of the tunnel is negligible. The brisk movement of air enables the temperature and humidity to be controlled very accurately.

RESULTS

To determine its performance the tunnel was operated by the estate staff under the minimum of supervision consistent with obtaining the necessary readings, so that the results could be regarded as typical of Estate practice rather than Laboratory procedure.

The first tests were carried out on the drying of sheet. The rubber was prepared in the usual manner, the general procedure being that used with any standard type of smoke house. The temperature was set at 140°F at the hot end of the tunnel and the temperature at the cold end started below 120°F and gradually built up during the twentyfour hours to about 130°F. To prevent any damage to the rubber the relative humidity, especially in the early stages, was maintained at a high level. After some four hours the humidity was reduced by manual operation of the air inlet and outlets in order to remove the large amount of water vapour then present in the tunnel. When this part of the drying had been completed, the tunnel was almost sealed until the next day when the cycle started once more. Thus, the only attention given to the tunnel during the twentyfour hours was the setting of the inlets and outlets twice during daylight hours, otherwise it was completely automatic.

Drying time for air dried sheets under these conditions was three days without any sign of deterioration in the rubber. The texture of the sheet was the same as that which the estate dried in a standard B type smokehouse in four and a half to five days.

Experiments were also carried out on sheet which was smokedried for the first twentyfour hours and then finished in the air drying tunnel. The object of these experiments was to produce RSS without heavy

consumption of firewood, which is of value to estates where firewood shortages are becoming acute. The results show that the sheets obtained were similar to the ordinary RSS and only slightly paler in colour. There was no difficulty in classifying the sheet as RSS 1. After carrying out these experiments, the tunnel thermostat setting was reduced to 95°F and the tunnel was then used for drying crepe. The crepe used was ordinary brown compo, approximately 1¼ mm thick and was hung on the standard size smokehouse trolleys which were the only ones available at the time. Under these conditions, the temperature at the hotter end of the tunnel remained constant at 95° and the cold end was approximately 5° lower. The drying time was four days.

FUEL COSTS

The fuel costs for drying sheet in this particular tunnel were calculated as 0.5 cents per pound when the tunnel was operating at its maximum capacity. With crepe the drying costs were 0.6 cents per pound when full. The type of trolleys used were not entirely satisfactory for crepe because the spacing of the broties was too large and consequently the weight of rubber in the tunnel was not as high as it could well be. In both instances it became evident that the tunnel length could be increased to take twelve instead of eight trolleys with only a slight increase in fuel consumption: in which case the total drying cost should be held well below 0.5 cents per pound.

The great advantage of this tunnel over any previous ones is that complete control of all the drying factors has been achieved so that the tunnel can be operated at the maximum efficiency with the minimum of attention.

FURTHER DEVELOPMENTS

Where tunnels are used for crepe drying only, the design can be considerably simplified by not having the large number of air outlets in the roof and arranging the system so that it can be automatically controlled both from the point of view of temperature and humidity. With regard to building costs; for crepe tunnels, it is simplest to convert an old type of crepe drying shed to tunnels by clearing the ground floor and building a number of tunnels side by side inside the existing building. By doing so, the partitions between the tunnels can be made of very light material which is chosen more on its thermal insulating properties rather than from considerations of strength and weather proofing.

The writer wishes to thank the Directors of The Rubber Trust Ltd, the Estates Supplies and Trading Co, (Malaya) Ltd, and The General Electric Co. (Malaya) Ltd, for permission to publish this article.

D.H. FREAN

The main malarial season—*is from May to June. In Planters' Bulletin 6 a note appeared, entitled 'Replanting and Malaria'. A revised edition of Malaria Control by Modern Methods is obtainable from the Secretary, Malaria Advisory Board, Institute for Medical Research, Kuala Lumpur. The price is 50 cents.*

Soil Analyses

Soil samples are often received at the Rubber Research Institute with a request that chemical analyses should be done to determine what nutrient elements are deficient and that advice be given regarding fertilizer treatment. At first sight it seems reasonable to assume that, because the nutrient elements needed for growth of plants are taken from the soil, a chemical analysis of a sample of that soil should show which ones are inadequately supplied. Unfortunately, a chemical analysis of the soil is seldom satisfactory, either for diagnosing the cause of backward growth of plants or any other abnormality, or for determining fertiliser requirements or treatments for soils.

The soil is a very complex material. The mineral elements contained in it occur in several form, some of which are readily available to plant roots, others are available at slow rates, while some are completely unavailable. The availability of the various elements is, therefore, the important factor and, in spite of investigations over many years, no generally acceptable methods of estimating the proportions of nutrient elements which are available have been found. Chemical methods, most of them time consuming and expensive. can be used for measuring the total quantities of the mineral elements but it was realised long ago that the total quantities measured by these methods bear no useful relationship to the amounts which plants can take up from the soil.

It is true that chemical methods are known, and are widely used, for estimating a certain proportion of the different nutrient elements which is readily available to plant roots, but they are empirical and do not necessarily measure the total amounts of available nutrients. The values obtained by these methods are relative and not actual values. They are useful for comparing one soil sample with another, and make it possible to say that the amount of any particular mineral element available to plants is more in one soil than in the other. However, it is seldom possible to state with confidence that the amount measured in a given soil sample is inadequate for healthy growth of the plant.

There are other reasons why chemical analyses are not satisfactory for determining the fertiliser requirements of soils. The availability of several nutrient elements can depend on the plant which is being grown, and even on the clonal variety of that plant. We know, for example, that clone PB 86 may grow poorly and show symptoms of nutrient deficiency in an area where the more vigorous clones, such as Tjir 1, grow healthily and strongly. Even with any one plant, or one clone, availability of mineral elements can vary widely because of a number of soil factors, such as the degree of acidity or alkalinity of the soil water logging and on the quantity of organic matter present.

There is still another important reason why chemical analysis of soil samples sent in by rubber planters is of doubtful value for determining fertiliser requirements. The chemical composition of a soil is known to vary considerably from place to place, even though it may appear to be perfectly uniform in the field. This variation may occur between sites separated by only a few inches. The results, therefore, of chemical analysis of a single sample casually taken from one point in the field may not give a valid estimate of the nutrient status of the soil in the

area as a whole. This difficulty can be overcome partly by taking samples from a large number of points within the field but even then the sampling error can be quite high.

However, soil analysis can provide useful information in certain circumstances, mainly for confirming diagnosis of nutrient deficiency based on visual inspection of the plants or on leaf analysis. Soil samples for this purpose should be sent to the Institute only on request and after receiving instructions on the method of collection of the samples.

INFORMATION REQUIRED TO INVESTIGATE THE CAUSE OF BACKWARD GROWTH OF RUBBER

When our assistance is sought to investigate the cause of backward growth or abnormal foliage conditions, a full description of the area should be sent to us with special emphasis on the condition of the rubber plants — age, type of planting material, average girth, condition of the foliage, previous manuring history with a brief note on method of application of the fertilisers. A note on the type, density and method of control of the ground cover will be of help, also a brief description of the soil with a statement on topography (flat, undulating or hilly). If the leaves of the rubber plants are discoloured, samples of leaves from healthy and affected plants in the same area should be sent following the instructions given on pages 21 and 22 of *Planters' Bulletin 4*. It is much more likely that examination and analysis of leaf samples, rather than soil samples, will provide useful information for diagnostic purposes. Each case will be considered on its merits and we will then decide whether soil samples should be obtained to investigate the problem further. Normally, we would prefer to collect soil samples ourselves, but if this is not convenient a request with full instructions on method of sampling, will be made for them to be sent. This method of sampling would be different from that which is described below.

EXAMINATION OF SOIL SAMPLES FOR IDENTIFICATION OF SOIL TYPE

We are sometimes called upon to assess the suitability of land for planting or replanting with rubber trees. For a problem of this kind, soil samples will serve a useful purpose. While inspection of the land would be more satisfactory, it may not always be convenient, and we are then prepared to express an opinion based on examination of soil samples. Such samples would be required for identification of the soil type and not for a detailed chemical analysis to estimate the content of plant nutrients. With a background of knowledge of the different soil types in the country, and of the requirements of rubber trees, it will be possible to express an opinion on the suitability of the soil based on examination of samples taken in a manner which would enable us to identify the soil type. Furthermore, we can also make broad generalizations regarding the type of fertilizer that is likely to be most suitable for trees of different ages based on examination of samples sent for identification of soil type. For instance, it should be possible to tell whether Mixture M or Mixture X is likely to be more suitable for young rubber areas and whether Mixture C, Mixture Y or Mixture C_2 should be used for older areas.

INSTRUCTIONS FOR SAMPLING SOILS FOR IDENTIFICATION OF SOIL TYPE

Selection of sampling site — Soil differences occur, in varying degrees, over any block of land and sampling sites should be selected in each of the main soil types that can easily be detected by eye. The selection of sites will be easier on land planted with rubber than in jungle land, where sampling may have to be restricted to rentisses along which sites may be chosen at intervals suitable to whatever major soil variations are noticeable. Abnormalities and irregularities, such as exposed hill tops, eroded stream beds, mounds and depressions, former tree sites, burnt stumps or local, badly drained patches should be avoided.

Method of sampling — At each sampling site, a soil profile pit should be dug to a depth of five feet, about three feet square and with vertical sides; the soil thrown out should be heaped so as to leave at least one surface edge uncontaminated by sub-soil.

Soil samples should be taken from a freshly cleared face of the pit so as to represent each major soil change with depth that can be detected; the changes may be judged by colour, texture or feel, gravel, stones, rock *etc.* Undecomposed organic litter should be lightly brushed or scraped away before the surface sample is taken. The sampling depth or horizon should be marked by a horizontal cut across the side of the pit and the depths of each horizon should be recorded in inches.

Where soil differences are gradual, merging into one another, or where there is no noticeable zonation, arbitrary horizons can be measured off and samples may conveniently be taken at the following depths: surface soil 0-3 inches, soil between 3 and 6 inches, at 12 inches, 24 inches, at 36 inches and at 48 inches. The samples should be collected in cloth bags or tins (cigarette tins are suitable), and each should be clearly labelled or marked on the outside and also with a folded label inside the container so that the pit number and sampling depth are identifiable.

Descriptive information required:

1 Rough sketch map of the area indicating the topography and pit sites. Topographical features may be classified broadly as flat or almost flat, gentle slope, steep slopes.

2 Depth of water table, if visible, in each pit.

3 History of previous cultivation State nature of existing growth—jungle, belukar, lalang *etc.*

4 If samples are taken in land in which rubber trees are growing, relevent information regarding the trees should be given—planting date, type of planting material, condition of the trees, depth of lateral root development, manuring and cultivation history, recent yields and nature of ground cover. If the foliage shows any abnormal discoloration, this should be described.

GENERAL

It will be appreciated from the foregoing remarks that planters should not forward soil samples for chemical analysis if the purpose is to determine the cause of backward growth or fertiliser requirements, for which the best procedure is to write to us explaining the problem and giving

full particulars of the area concerned. Leaf samples may be sent if the colour of the foliage is abnormal. We will decide what action to take to investigate the problem in the light of information received.

On the other hand, soil samples may be sent if an assessment of the suitability of land for planting or replanting with rubber is required. Similar samples may be sent from areas where rubber is already planted if the purpose is to enquire which of the standard fertilisers normally used in rubber areas is likely to be most suitable. Enquiries regarding the need for fertiliser treatment, or the need for special treatment, come in the first category, for which soil samples are of little use in the preliminary stages of investigating the problem.

Gloeosporium Leaf Disease

GLOEOSPORIUM LEAF DISEASE is but one of several diseases of hevea caused by *Gloeosporium alborubrum*. The fungus has been mentioned before in this bulletin as one of the agents responsible for secondary leaf fall (page 59 of *Planters' Bulletin 3* and page 77 of *Planters' Bulletin 13*) and as the cause of a parasitic dieback (page 82 of *Planters' Bulletin 20*). Gloeosporium leaf disease has also been briefly described and illustrated in the leaflet enclosed with *Planters' Bulletin 5* when attention was drawn to the different appearance of South American leaf blight. Gloeosporium spots are small and each is surrounded by a brown margin with a yellow halo. Several spots may coalesce to form an irregular lesion which perforates the leaf. On older leaves the spots became raised from the leaf surface on a small cone. As with most hevea leaf diseases, when a heavy infection develops before the cuticle has hardened, the affected portion of the lamina shrivels instead of discrete lesions being formed. Severely affected leaves will fall. Damp conditions bring on the fruiting stage of the fungus, which is highly characteristic, and visible under a lens as tiny pink cheesy masses formed in the dead centres of lesions or generally over a shrivelled leaf. The spore masses may be so abundant that they can be seen by the naked eye.

Leaflet with Gloeosporium spots and lesions.

Although found on both buddings and seedlings of all ages, Gloeosporium leaf disease causes most concern as a disease of young buddings. In this it contrasts with bird's eye spot, which is essentially a

Bud shoot attacked by Gloeosporium leaf disease.

disease of seedlings up to about three years old. In wet weather *Gloeosporium* may extend from the leaves down the succulent scion shoots to the stem and back to the bud patch, destroying the budding.

Damp conditions are essential for the spread of the disease. In dry weather the spore masses shrink and harden. Wet weather softens the mass and the spores are then readily dispersed in rain drops, splashed from leaf to leaf and plant to plant, or carried by the wind.

The spores of *Gloeosporium alborubrum* are thin walled and more readily killed by fungicides than those of *Helminthosporium heveae,* which has so far proved difficult to control. Fungicides containing copper are best, sprayed or dusted on to the leaves at weekly intervals. Bordeaux Mixture, prepared as described on page 55 of *Planters' Bulletin 18,* is satisfactory and cheap, but when only small quantities are required it is more convenient to use one of several locally available proprietary copper-based fungicides. Sulphur, which effectively controls *Oidium* though it is rarely needed for this purpose in Malaya, is ineffective against *Gloeosporium.*

Closely related to *Gloeosporium* is the genus *Colletotrichum,* distinguishable by the presence of short black bristles associated with the spore masses. They can be seen under a hand lens. One *Colletotrichum, C. ficus,* is so characteristic in its appearance and occurrence that it has received a separate description (page 106 of *Planters' Bulletin 8*).

Chemical Division Advisory Work 1955

The most troublesome of producers' problems during last year were again concerned with latex concentrate: there were rather fewer inquiries on sheet and crepe. A number of estates selling latex to concentrate producers inquired for accurate methods of determining dry rubber content, and are now equipped for the British Standards Institutes' test.

Bacteria — A number of factories have made considerable efforts to improve the quality of their latex concentrate, on our advice. As more producers have realised the dangers of contamination so the requests

for bacterial counts have increased. A routine laboratory is being set up to cope with the demand. This testing has often led to an examination of field and factory conditions, with a view to eliminating sources of infection. Recommended modifications in procedure, with far more thorough cleansing, have been put into practice with striking improvements in latex quality.

This extends earlier work on latex contamination, which used the volatile fatty acid test as a criterion. A VFA test does not indicate the presence of live bacteria, but only that contamination has taken place at some time unknown; nevertheless it continues to serve a most useful purpose as a preliminary rapid means of detecting whether putrefaction has occurred in latex. Much work remains to be carried out, particularly concerning the effects of transportation and storage. Early use of preservatives in the field remains the best way of insuring the good quality of field latex; formaldehyde is particularly effective in reducing the formation of volatile fatty acids.

Ladder tapping — Further observations on the effect of ladder tapping have shown that concentrates prepared from the latex often differ in mechanical stability from those from normal latex; sometimes an increase has been noted, sometimes a decrease. For Tjir 1 buddings from six different areas, ladder tapping reduced the mechanical stability of the concentrate by almost a half.

Preservation — Preliminary work has suggested the value of three new preservative systems for latex, not only as anticoagulants in the field and as short term preservatives in the factory, but also as long term preservatives for concentrate. The three systems are: low ammonia with antibiotics, low ammonia with sulpha derivatives, and low ammonia with boric acid. Patent applications have been made for all three systems, but it will be some time before their commercial value can be established.

Skim rubber — Latex producers have shown much interest in the disposal of skim latex, especially in deammoniation methods and in the production of good looking skim sheet and light coloured skim crepe. A simple test for distinguishing skim rubber from standard RMA grades has been developed.

Defects in sheet — Due to higher prices and increased differentials between grades, methods of avoiding defects have been sought. The principal defects in sheet were bubbles formed after precoagulation and fermentation. Upper tapping cuts and intensive tapping methods have often led to bubble formation. The presence of high proportions of gas producing bacteria suggests that this results from increased infection, possibly owing to the flow of latex over larger areas of bark. The addition of 0.06 per cent of formaldehyde on the latex usually prevents bubbles; the sheet may then be darker, but is usually of good quality. There is no evidence that yield stimulants lead to bubble formation. They have been suspect because of their use in conjunction with upper cuts and intensive tapping.

Pre-coagulation — Latex from Gl 1 buddings on coastal areas in Selangor has given particular trouble. Anticoagulants such as formaldehyde and boric acid have sometimes improved matters but no completely satisfactory method has yet been found. A better practice is to mix the unstable latex with an equal volume of a stable one, adding

formaldehyde to each coagulating tank together with water or with the acid; addition of formaldehyde to the latex bulk may cause local clotting.

Drying — Numerous enquiries have been received regarding smokehouses and it is of interest to note that RRI type smokehouses are now being built almost exclusively. This tunnel type smoke house can readily be adapted to air drying — an advantage on estates which have to use other means of heating, such as oil firing, due to firewood shortage.

Considerable interest has been shown in air dried sheet arising both from the shortage of firewood and from market demands which have often placed ADS at an appreciable premium over RSS 1. Samples of sheet partly smoked and partly air dried have been examined, and the properties have usually been satisfactory. Smoking should follow air drying so that the rubber may retain the maximum amount of smoke ingredients, to resist mould.

Bleaching of crepe — Most crepe continues to be produced by the R.R.I. process for bleaching pale crepe, apart from a little total latex crepe and No. 1 pale crepe. Commonly only a few ounces of the bleaching agent are used per 1,000 lb of rubber, but some times as much as 30 ounces are used. Interest in pale crepe production fell off considerably during the early part of 1955 but revived towards the end of the year. Interest in sole crepe followed a similar trend but there were fewer inquiries than in past years. Two factories have produced satisfactory brown sole crepe, in which skim rubber was mixed with the customary scrap and lump. This appears to be an outlet for skim rubber, which avoids infringement of R.M.A. Type descriptions.

Colour of remilled crepes — Means of lightening the colour of brown crepe are continually being sought and a recent observation is worth recording. The darkening of scrap rubber is usually thought to be due to enzymes; it has now been shown that a high manganese content can lead to further darkening. Contrary to earlier belief, a very few Malayan rubbers contain a relatively high proportion of manganese. These are tree scraps, for the manganese occurs in the bark of the tree and thus contaminates the scrap. Cup scrap is not affected. It is emphasised that as far as is known at present trees with bark having a high manganese content are rare and have occurred only in two areas. Washing the contaminated scrap with detergents prior to milling considerably reduces the manganese content, and sometimes improves the colour of the crepe.

Colour of normal compo crepe can often be improved by treating the scrap with sodium bisulphite solution, which inhibits enzyme activities. Soaking with detergents sometimes improves colour and almost always reduces dirt content.

R. R. I. News

The Jawi edition of the booklet *Replanting on Smallholdings* (*Planters' Bulletin 21* page 103) will be available shortly and copies will be supplied to planters on request. The price is $1 post free in Malaya.

Please remit with order.

New Strains of Hevea Brasiliensis in Malaya

Communication 298 by C.W. Brookson in the *Journal of the Rubber Research Institute of Malaya* details the steps taken to obtain new strains of *Hevea brasiliensis* from South America. An exchange of material was made between the Rubber Research Institute and the Instituto Agronomico do Norte, Brazil. Twentyfive clones developed by the Institute and a number of strains of padi and oil palm kindly made available by the Director of Agriculture, Federation of Malaya, were exchanged for twentyfive tested *Dothidella*-resistant clones which were the property of the Instituto Agronomico do Norte.

The exchange was made through the good offices of the United States Department of Agriculture, who provided quarantine facilities at their Plant Introduction Section. The Commonwealth Mycological Institute and the London Committee for Rubber Research, also assisted in the disinfestation and repacking of the budwood. Full details of the performance of the imported clones are shown in the publication.

In addition to these twentyfive clones, a number of seedling collections were also imported through the good offices of Her Majesty's Colonial Office. Such information as is available on these collections is also shown. The proposed plan for utilising the material, to produce a high yielding tree resistant to *Dothidella ulei* (South American leaf blight), is outlined in the publication. The intention of the publication is to put on record all information concerning the importation, and to note the ready cooperation of a number of diverse Organisations.

Giant Leaves in Hevea Brasiliensis

We have received from the Manager, Sagil Estate, Johore, a number of giant leaves of clone Pil B84. The largest of these leaves has a lamina measuring 19.3 inches in length by 7.7 inches at the widest part. The leaves are from trees which were planted in 1940 at a spacing of 12 feet by 18 feet, and which have been manured regularly with generous but not excessive amounts of fertiliser.

The tree from which these leaves were taken had suffered from wind damage and had been pollarded at about 15 feet from the ground and some five feet from the commencement of branching. Fresh branches grew from immediately below the pollarding, and the new branch from which the leaves were taken showed normal sized leaves on the end whorls, and abnormally large leaves on the first whorl. The giant leaves could be described as shade leaves, not being directly exposed to the sun.

The Manager of Sagil Estate claims that the largest leaf submitted is a record and we ourselves do not remember having seen leaves of such size. No doubt other estates in the country who have observed such phenomena would be able to beat this record, at the same time sending us the specimen and a note on the clone or tree, manuring history, and situation from which the leaf was obtained. Large shade leaves are not uncommon, but leaves of this size are extremely so.

An Unusual Effect of Lightning

A damaged young tree that was brought into the Pathological Division was found to be injured in a way that could only have had a physical cause. Lightning was suspected because of the sudden appearance of the symptoms on a small group of trees, although the injury was not typical. A field examination confirmed this view. The site

Collar of a lightning damaged tree, with the bark removed to show wood discoloured above and below soil level.

was near the summit of a steep hill, where the soil was an impervious clay. The trees were clonal seedlings two and a half years old, spaced every ten feet on contours which were twenty feet apart. Twentyfive trees were affected, in two rows at the edge of a replanting bordering on low scrub. Obvious lightning symptoms were found on nine trees in a compact group, where the leaves were wilting and turning brown, and boring beetles were invading the wood. The damage to the rest of the trees was hardly visible externally. The bark at the collar was dead for a distance of one to two inches above ground and four to six inches below. On ten of them the bark was dead all round the collar, but the rest were affected to varying degrees on one side only, then in every case the affected part was facing towards the centre of the discharge. It seems likely that the lightning was conducted along the surface of the soil by water lying round the trees at the time of the storm, the injury consequently being localised at their collars.

Plant Investigations

Investigations to compare bark analysis with leaf analysis as a means of assessing the mineral status of rubber trees were carried out last year, and preliminary results showed that analysis of bark samples may be satisfactory. In view of the variability in chemical composition of leaves according to age, position in the crown, and the practical difficulties of sampling, bark analyses may prove more useful than leaf analyses for the diagnosis of nutritional disorders of mature trees.

The possibility of predicting the yielding capacity of unproven clones on the basis of chemical estimation of rubber in the tissues at an early age was also considered. There was a measure of agreement between the rubber concentration of petioles and the results of test tapping of different clones, but much more work must be done before the procedure can be applied for the assessment of yield potentialities.

Courses for Senior Estate Conductors

No vacancies remain for the refresher courses announced in *Planters' Bulletin 22*, nor can further applications be considered this year.

No Longer Available

Planters' Bulletin 2, 6, 7 and *8* are out of stock. A set of back issues, complete, except for these four, can be provided post free in Malaya for $9.50.

OUR COVER ILLUSTRATION SHOWS A FROND OF GLEICHENIA LINEARIS. THIS FERN, OF WHICH THERE ARE MANY VARIETIES, IS COMMONLY CALLED BRACKEN IN MALAYA. IT SPREADS BY STEMS CREEPING JUST BELOW SOIL LEVEL. THE AERIAL PORTIONS SCRAMBLE AND CLIMB OVER OTHER VEGETATION. THIS PLANT COMPETES STRONGLY WITH HEVEA AND SHOULD BE ERADICATED.

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